FLUKE networks

# WaveRunner™

802.11b Wireless Network Analyzer

Getting Started Guide

PN 1778211
June 2002, Rev. 3, 4/03
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## *Software Notice*

The WaveRunner is powered in part by the Linux Operating System and other publicly available software. A machine-readable copy of the corresponding source code is available for the cost of distribution. Please contact the Fluke Networks Technical Assistance Center (1-800-283-5853) and visit the GNU web site (http://www.gnu.org) for more information.

# *Table of Contents*

# *WaveRunner*™
## *Getting Started Guide*

## *Welcome to WaveRunner*

Thank you for purchasing the Fluke Networks WaveRunner wireless network analyzer.

WaveRunner, the newest member of the Fluke Networks handheld tools family, brings true handheld operation and ease-of-use to wireless LAN tools. Unlike laptop-based solutions, WaveRunner is designed to work wherever the wireless LAN network extends: in the conference room, on the production floor or at the outdoor receiving dock. Whether you're detecting rogue access points, designing a wireless LAN deployment, verifying a recent installation or troubleshooting wireless connectivity problems, WaveRunner gives you the vision you need to manage your wireless network.

# Before You Start

*Note*

*The WaveRunner consists of an HP iPAQ, a Fluke Networks Wireless LAN PC card, and the WaveRunner software. The original HP iPAQ software and operating system have been replaced.*

**Caution**

**WaveRunner is equipped with a wireless network access card allowing use of channels 1 through 14.**

**Channel selection based on the country or a custom configuration is an easily modified configuration accessed in the WaveRunner Setup menu (Setup | General Settings). Based on this information, only those channels that are allowed for the selected country are displayed as legal channels. IT IS YOUR RESPONSIBILTY TO USE ONLY LEGAL CHANNELS.**

*Note*

*In the United States, the FCC allows use of channels 1 through 11. United States users need to be aware that FCC regulations within the United States does not permit use of Channels 12 through 14, and use of these channels is illegal.*

## *Safety Information*

⚠ PLEASE READ THE FOLLOWING WARNINGS FOR SAFETY

### ⚠ Warnings

- **Do not use this product if it is damaged. Before using the product, inspect the case. Look for cracked or missing plastic. Pay particular attention to the insulation surrounding the connectors.**
- **Do not operate the product around explosive gas, vapor or dust.**
- **If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.**
- **The WaveRunner system unit (HP iPAQ) and the PC card sleeve contain lithium polymer battery packs. Recycle or dispose of these items properly. There is a risk of chemical burn and/or fire if the batteries are handled improperly. Do not take apart, crush, puncture, short contacts, or dispose of in water or in a fire.**

## *Contacting Fluke Networks Sales, Service, and Support Centers*

Have a question about using WaveRunner? Contact the Technical Assistance Center at one of the numbers listed below, or email: support@flukenetworks.com.

USA: 1-800-283-5853 (1-800-28-FLUKE)
Canada: 1-800-363-5853 (1-800-36-FLUKE)
Europe: +31-402-675 200
Japan: +81-3-3434-0181
Singapore: +65-6738-5655
Anywhere in the world: +1 425- 446- 4519

Also, visit us on the Web at www.flukenetworks.com.

## *Registering the WaveRunner*

When the WaveRunner is initially turned on, a Registration screen will prompt you to register the WaveRunner. You will be instructed to go to the Fluke Networks registration site and fill out the on-line registration, or call us at 1-800-283-5853 (or 1-425-446-4519). Once the registration is complete, you will be given a six digit key code via email. Enter this code in the “Enter key code below” field and the screen will be removed.

# The WaveRunner and Supplied Items

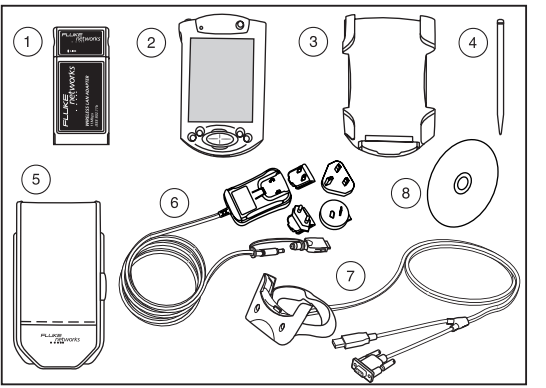


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**Figure 1. Supplied Items**

## Supplied Items

**Table 1. Supplied Items**

| | |
|---|---|
| 1 | Fluke Networks Wireless LAN card |
| 2 | HP iPAQ |
| 3 | HP iPAQ PC card sleeve |
| 4 | Stylus (PN 1778159) |
| 5 | Holster (PN 1778209) |
| 6 | AC universal charger (PN 2063322) |
| 7 | Cradle |
| 8 | WaveRunner Multi-language documentation CD-ROM |
| | Getting Started Guide (this book) |
| | Warranty card (not shown) |
| | Lithium polymer battery pack (installed in sleeve, not shown - PN 2063417) |

# Getting Acquainted with the WaveRunner

The WaveRunner has the following buttons and user options:

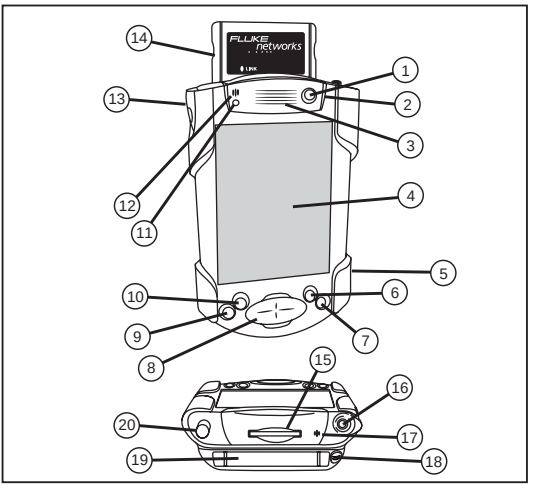


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**Figure 2. Front Panel Identifiers**

**Table 2. Front Panel Identifiers**

| | |
|---|---|
| 1 | Power button |
| 2 | Battery charge indicator |
| 3 | Speaker |
| 4 | Color display |
| 5 | HP iPAQ PC card sleeve |
| 6 | Help button |
| 7 | Back button |
| 8 | Navigation button (up/down, left/right). The navigation button can also be used as the select button by pressing the middle of the button. |

| | |
|---|---|
| 9 | Home button |
| 10 | Keyboard button |
| 11 | Background light sensor (not used) |
| 12 | Microphone |
| 13 | Memo record button |
| 14 | Wireless LAN card |
| 15 | Memory card slot (not used) |
| 16 | Headphone jack |
| 17 | N/A |
| 18 | PC Card eject button |
| 19 | PC Card slot |
| 20 | Stylus (push to eject) |

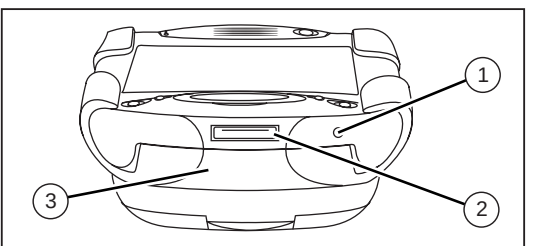


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**Figure 3. Bottom Panel Identifiers**

**Table 3. Bottom Panel Identifiers**

| | |
|---|---|
| 1 | Reset button |
| 2 | Battery charge connectors |
| 3 | HP iPAQ PC card sleeve |

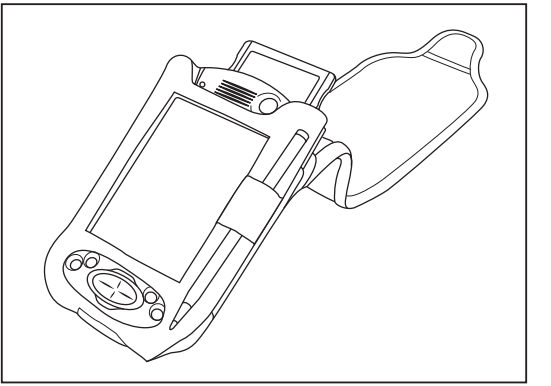

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**Figure 4. Front View in Holster**

# *Using the WaveRunner*

## *Charging Your WaveRunner*

The universal charger adapter (PN 2063322) comes with four international AC plug connectors. The charger can handle a line voltage between 100 and 240 Volts at 50 - 60 Hz.

To install a plug connector into the charger adapter, simply slide the connector into the holding slots until you hear a click. See figure 5.

To remove a plug connector from the adapter, press the holding tab and slide plug connector out.

*Note*

*To properly condition the battery(s), a new WaveRunner must be initially charged for 8 hours.*

*If the batteries become completely discharged, you must connect the unit to AC power and press the reset button. See figure 3.*

*The sleeve battery pack is replaceable (PN 2063417).*

A fully charged WaveRunner can operate continuously for up to 3 hours and longer depending on which standby and backlight settings are chosen in Setup | Power Settings. To fully charge a WaveRunner, it will take approximately 8 hours with the unit off.

Charge your WaveRunner on a regular basis with either the AC adapter or the cradle.

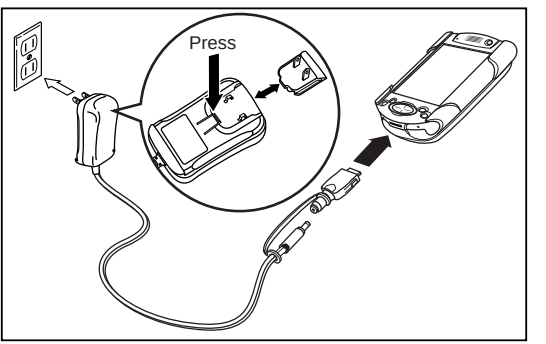


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**Figure 5. Charging directly with the AC adapter**

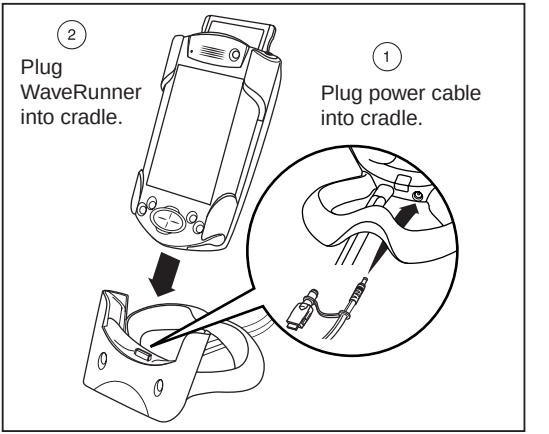


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**Figure 6. Charging with the Cradle**

The charge light (see figure 2) blinks when recharging the battery. This is also true for the charge light on the sleeve. The charge light is solid (non-blinking) when the battery is fully charged. The battery will not overcharge.

## *Routine Care*

To keep the WaveRunner in good condition and working properly, follow these guidelines:

- Keep your WaveRunner away from excessive moisture and temperature extremes. Do not expose it to liquids or precipitation.
- Do not place anything on top of the WaveRunner to prevent damage to the screen.
- Store your WaveRunner in a protective case when not in use.

- Clean your WaveRunner by wiping the screen and exterior with a soft cloth moistened only with water.
- Avoid exposing your WaveRunner to direct sunlight or strong ultraviolet light for extended periods of time. Also avoid scratching the surface of the screen and striking it against hard objects.

*Note*

*Use only the WaveRunner stylus to prevent scratching the screen.*

## *Powering the WaveRunner On/Off*

Simply press the **On/Off** button located in the upper-right corner on the front of the WaveRunner (see figure 2 for the **On/Off** button location).

## *Using the Touch Display*

Only the supplied stylus should be used on the touch panel display. See figure 2 for stylus location.

# *WaveRunner Navigation*

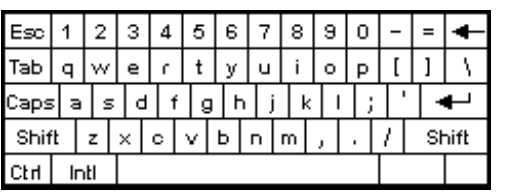
On each WaveRunner screen the following common buttons are found:

 Help - Press this icon to open help on the current topic. Click on the “X” in the help screen upper-right corner to close help.

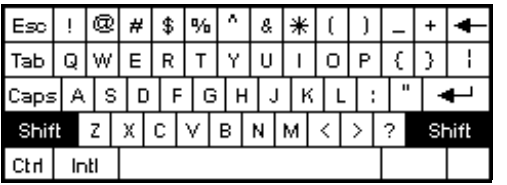
 Close screen – The “X” is displayed in the screen’s upper-right corner next to the Help button on every screen except the main screen. Pressing the “X” closes the currently opened screen. Screens are opened on top of previously visited screens. Press the “X” to close each screen until you reach the main screen.

 Home – Press this icon on any screen to return to the main screen.

 Keyboard – Press this icon to open and close the keyboard tool as shown below.



Pressing the Shift key opens the second bank of keyboard keys as shown below:




Fields that require text or numeric entry automatically open the keyboard tool when selected. Pressing the keyboard button a second time closes the keyboard.

 Speaker volume – Press the speaker icon to open the volume control dialog as shown below:


Press and slide the volume slide bar to adjust the volume (0 = lowest, 100 = highest), or check the Mute check box to disable sound. Press the speaker volume button a second time to close the volume control dialog.

Time and Date – Press on the time to display the date. Press on the date to display time. Time and date are entered in the Setup | General Settings screen. Time and date must be initially setup for the WaveRunner to save correct time stamps for test results.


Battery indicator – Displays an approximate amount of remaining battery life. The indicator goes from green to yellow to red (needs to be charged). Whenever not using the WaveRunner, it is recommended it be placed on a charger. The battery will last up to 3 hours before needing to be charged. It takes approximately 8 hours to fully charge the battery with WaveRunner off.

When you press the battery icon, it displays a graph of battery usage and approximate battery life remaining.

## *Powering On for the First Time*

When you first turn on a WaveRunner, the General Settings screen is automatically displayed prompting you to enter owner information, country location, time and date information, whether you want to hear button clicks and turn on/off the Rogue and Unknown devices auditable alarm. Once you save these settings, the power up sequence will then bypass the General Settings screen and open the main screen shown on the next page.

You can change this information at any time. This information is accessed from the main screen by pressing **Setup | General Settings**.

## *Selecting the Country Location*

The country selection is the first item you should configure before using the WaveRunner. Country selection determines which channels are legal and illegal for a region.

Illegal channels are display in red throughout all screens. In the Channels screen the channel number box is displayed in red for illegal channels.


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**Figure 7. Country Channel Selection**

To select a country, select **Change** in the General Settings screen. Then select **Use a predefined country** (default), and then select the country from the Country drop-down list.

If your country is not listed, select the **Use the following country information** option, enter the country name, and choose the channels that are legal for the country.

*Note*

*When a function is started that requires WaveRunner to transmit on an illegal channel, a warning will pop up. The warning popup will allow you to cancel prior to transmission or continue.*

## *WaveRunner Main Screen*

This is the main screen. All functional areas are navigated from here. The WaveRunner user interface is divided into eight functional areas. Each functional area is described in this section.

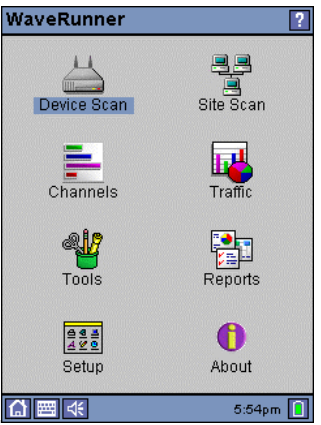


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**Figure 8. Main Screen**

## *Device Scan button*

Pressing **Device Scan** opens the Device Scan - Access Points screen. This screen displays a list of reachable Access Points on your local wireless network.

*Note*

*An Access Point whose channel number is displayed in red is operating on an illegal channel. The country setup determines which channels are legal and illegal. The country location is selected in the Setup | General Settings screen.*

Information such as the manufacturer name, SSID, WEP status, channel number and signal strength are displayed at the top of this screen.

The colored box to the left of the device name indicates the following:

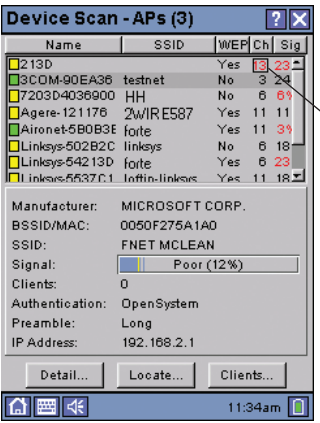
- green - known device
- yellow - unknown device (default)
- red - roque device
- blue - neighbor device

Initially, when the WaveRunner is first powered on, all devices are displayed as “unknown” (yellow). The color assignment is configured in the Edit Access Point and Edit Client screens found under the Setup | Device List screen.

Also, an SSID name in italics indicates that the SSID is not configured. Usually this indicates WEP has been turned on, but the encryption keys have not been set.

Additional detail about a highlighted Access Point is displayed at the bottom of the screen. This detail includes the BSSID/MAC address, SSID, signal strength, number of associated clients, type of authentication used, preamble type, and IP address.

The signal strength represents the following values: Excellent (80 - 100%), Good (60 - 79%), Fair (30 - 59%), and Poor (0 - 29%).




A red channel number indicates the device is operating on an illegal channel. Country selection in the General Settings screen determines which channels are legal or illegal.

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**Figure 9. Device Scan – Access Points Screen**

From this screen, you can select:

**Detail** – shows data transfer statistics for an Access Point.

**Locate** – locates an Access Point based on signal strength. A bar graph will show increasing signal strength, as WaveRunner gets closer to the Access Point. The WaveRunner will also beep faster as it gets closer to the Access Point.

**Clients** – discovers all clients on the selected Access Point and shows information about each client, including its name, signal strength, IP address, and some data transfer statistics. *See the Device Scan - Clients screen, figure 10, on the next page.*

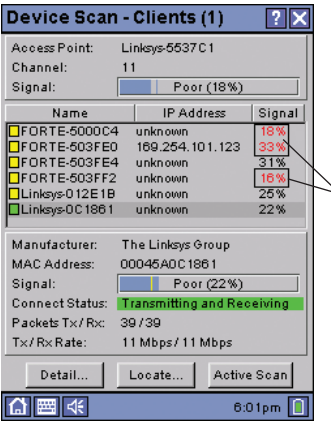


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**Figure 10. Device Scan - Clients Screen**

The Clients screen displays all clients for a selected Access Point. The Clients screen allows you to look at client **Detail**, **Locate** the client, and perform an **Active Scan**. The Active Scan will connect to an SSID and actively discover clients.

## *Site Scan button*

Pressing **Site Scan** displays all reachable Access Points and clients on the wireless network, and saves information about each device. After a Site Scan has been performed, you may generate a report on the data.

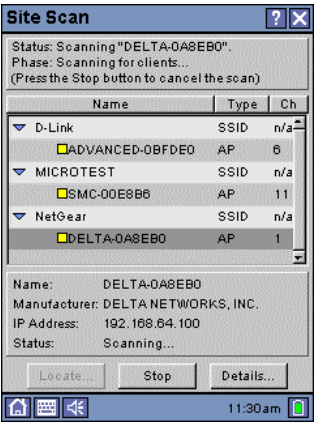


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**Figure 11. Site Scan Screen**

*Note*

*SSIDs will need to be configured before Site Scan can discover information for associated Access Points.*

*An Access Point whose channel number is displayed in red is operating on an illegal channel. The country setup determines which channels are legal and illegal. The country location is selected in the Setup | General Settings screen.*

From this screen, you can select:

**Locate** - locates a selected client based on signal strength. A bar graph will show increasing signal strength, as WaveRunner gets closer to the Access Point. The WaveRunner will also beep faster as it gets closer to the Access Point.

**Start/Stop** - Initiates and terminates the Site Scan.

**Details** - Displays information about the highlighted device.

## *Channels button*

Pressing **Channels** opens the Channels screen. The **Show:** drop-down list display the following criteria:

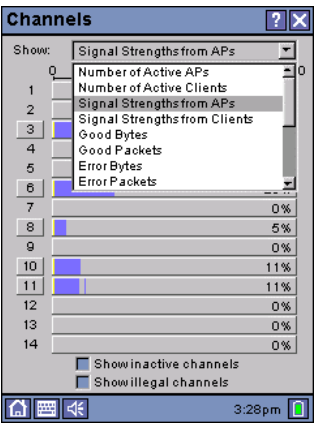


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**Figure 12. Selecting the Channels Screen Output**

Once you have selected the display criteria from the **Show:** drop-down list as shown in figure 12, WaveRunner will actively scan all 14 channels and present the data in bar chart format.

In this screen, you can select:

**Show:** - A drop-down list allows you to select the type of data that displays in this screen as shown in figure 12.

**Show inactive channels** - This option allows you to display or hide channels that are not in use by Access Points. Disable this option to hide all inactive channels. Inactive channels may display a value other than zero for some Show options (e.g. Error Bytes). This is caused by active channels that overlap inactive channel frequency allocations.

**Show illegal channels** -This option allows you to display or hide channels that are illegal based on the current Country selection. Disable this option to hide all illegal channels.

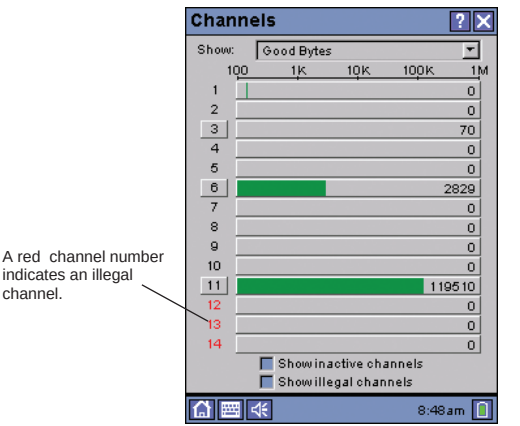


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**Figure 13. Channels Screen – Good Bytes**

On active channels, a channel number button is displayed where Access Points exist. Pressing a channel button opens the Channel Detail screen.

## *Traffic button*

Pressing **Traffic** displays protocol information on the selected device or channel. Data transfer information is displayed in bytes, packets, or as percent utilization. This data is displayed in Bar Chart, Histogram, or Pie Chart format for the selected device or channel.

From this screen, you can select:

**Top Talkers** - Allows you to “drill in” on a specific protocol selected from the protocol tree. Devices that are generating traffic with the selected protocol are then displayed.

**Start/Stop** - starts and stops the collection of traffic data.

**View** - configures the Traffic screen view options, including graph type and data options.

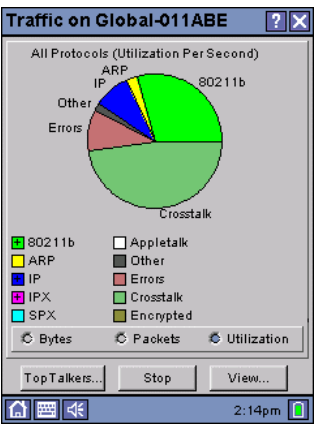


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**Figure 14. Traffic Screen**

## *Tools button*

Pressing **Tools** displays the following WaveRunner troubleshooting tools screen:

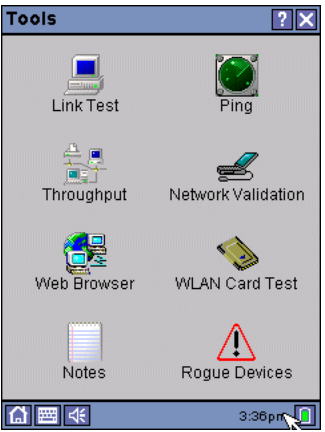


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**Figure 15. Tools Screen**

**Link Test** - connects as a client to an SSID or an Access Point, and shows information about the link, including signal strength, signal quality, IP address, MAC address, and transmit rate.

*Note*

*Signal quality is the signal-to-noise ratio. Low signal quality denotes excessive noise on the channel or neighboring channels that could cause performance slowdown.*

**Ping** - connects as a client to an SSID or Access Point and sends out an ICMP packet to the specified destination address. The specified destination address should reply back to the WaveRunner with its own packet.

The Ping screen displays the results of the Ping test, and allows you to set the destination address, packet size and start/stop the test.

**Throughput** - connects as a client to an SSID or Access Point and measures the data rate to a device. You can initiate either a Ping or FTP Throughput test. A Ping test will send data while adjusting the data rate until it detects data being lost. The FTP test measures the time it takes to send an internal file or receive an internal file from the device. Both these tests display the results as the average and best times graphically.

**Network Validation** - validates a Client connection to an SSID by connecting to one or more Access Points.

**Web Browser** - connects to an SSID or Access Point and opens an internet connection. Web proxy is configurable for the Web Browser.

**WLAN Card Test** - Tests third party Wireless LAN cards. The following WaveRunner functions work with 3rd party cards: Link Test, Ping, Throughput, Web Browser, and Software Update.

*Note*

*Third party Wireless LAN cards cannot be used to run other WaveRunner functions not mentioned above.*

**Notes** - Allows you to enter information and save it for later retrieval. You can create new notes or open, save, email or delete a note.

Also, the edit option's **Undo**, **Cut**, **Copy** and **Paste** are supported.

**Rogue Devices** - Alerts the operator to wireless Access Points and clients that might be violating network security. Wireless devices can be marked as known (green), neighbor (blue), rogue (red) or unknown (yellow). New devices are automatically marked as unknown. The Rogue Devices list displays all devices marked as unknown or rogue. Devices operating on an illegal channel are also listed.

From this screen, the operator can clear the list, locate a rogue device and edit device status.

## *Reports button*

Pressing **Reports** displays a list of saved reports to edit, view, or send. The available report types include: configuration, device list, SSID list, traffic reports, and site scan reports. These reports can be output in HTML or CSV format.

From this screen, you can select:

**Select** - selects a report to edit, view and/or send a report. **Select** also allows you to select the report format and enter a description.

**Delete** - deletes the selected report from the list.

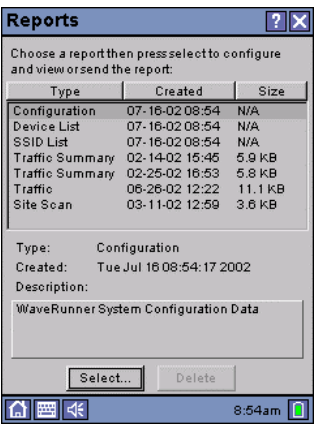


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**Figure 16. Reports Screen**

## *Setup button*

Pressing **Setup** displays the following configuration screen:

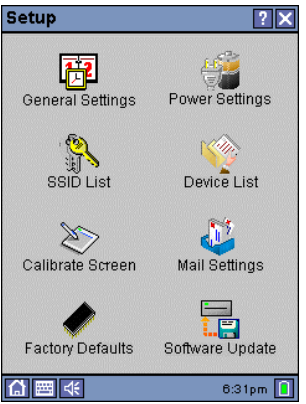


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**Figure 17. Setup Screen**

**General Settings** - General Settings allows you to enter WaveRunner owner information, country selection, set date/time information, set password protection, configure Button Clicks, and set the audio alarm for rogue and unknown devices.

**Power Settings** - allows you to set the backlight brightness level and operation, set the duration before WaveRunner turns off when not connected to power.

**SSID List** - manages the WaveRunner SSID list. From this screen, you can set a default SSID, edit an SSID name, add a new SSID, or delete an SSID.

If the WaveRunner is transported to another network where security is an issue, you can

select the **Delete** button and select a range of SSIDs to delete.

**Device List** - manages the WaveRunner Device list. From this screen you can edit a device, add a new device, and add audio comments about a device.

If the WaveRunner is transported to another network where security is an issue, you can select the **Delete** button and select a range of devices to delete.

**Calibrate Screen** - calibrates the touch screen.

**Mail Settings** - allows you to set the SMTP server, mail port, sender and destination addresses for emailing WaveRunner reports and notes. Common default mail settings and SMTP server discovery aid in configuring the mail settings.

**Factory Defaults** - restores the WaveRunner to its factory default configuration. All WaveRunner lists and settings are cleared.

**Update Software** - updates the WaveRunner with new software (as new releases become available).

## *About button*

The **About** screen displays the WLAN card and user/owner information.

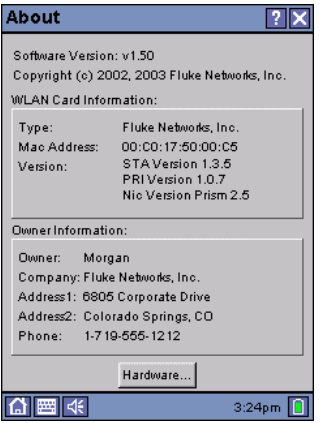


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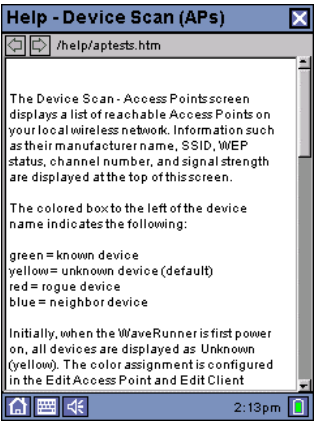
**Figure 18. About Screen**

# Using the Built-in Help System

## Accessing and Navigating the Help System

The help system is an integral part of the WaveRunner. While navigating the WaveRunner user interface, help can be accessed by selecting the ? button located on the top-right of each screen.




aov227s.bmp

**Figure 19. An Example Help Screen**

Help is context sensitive, i.e., pressing the help button ? displays the current screen topic.

# Troubleshooting Your WaveRunner

## Before Calling Technical Support

Before calling technical support, read the following to pinpoint many common problems:

### Is there less than 10% battery life left?

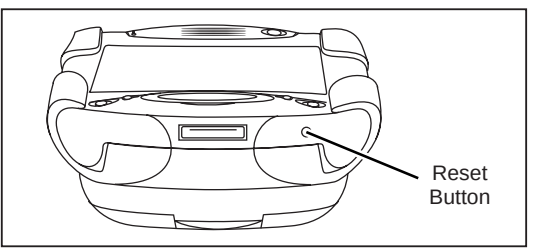
Running the WaveRunner with battery life below 10% will turn off the Wireless LAN card which causes inaccurate error messages or unusual behavior. Recharge the WaveRunner.

### Do you suspect the WaveRunner has locked up?

The WaveRunner may get into a state where it is no longer receiving data. If this occurs, press the Reset button, located on the bottom of the WaveRunner, as shown below.

*Note*

*Every time the WaveRunner is reset, it adds 5 minutes onto the time.*




aov182f.eps

**Figure 20. Reset Button Location**

## Will your WaveRunner be left idle for several days?

If you are not going to use the WaveRunner for several days, to keep the batteries fully charged, charge the unit in its charging cradle.

WaveRunner has the ability to remotely update its software. Please contact Fluke Networks Customer Support at 1-800-283-5853 for the new image location. Once you've received the location, enter it in the Setup | Software Update screen's <http://> field, place your WaveRunner in an environment with wireless Internet access, and then press **Start**.

# Specifications

**Table 4. General HP iPAQ Specifications**

| | |
|---|---|
| Weight | 184 g (6.49 oz) |
| Dimensions | 134 x 84 x 15.9 millimeters<br>(5.28 x 3.3 x .63 inches) |
| LCD touch screen display | Color TFT, 240 x 320 pixels, 64K-color support, .24-dot pitch |
| Processor | PXA250 |
| Internal battery | Lithium Polymer |
| Adapter/battery charger | AC input: 120V - 240V, 50/60Hz, .3A<br>DC output: 5V, 2A |
| Communications | Communication port, expansion pack connector (used by Wireless LAN card) |
| Operating temperature | 0° to 40° C<br>32° to 104° F |
| Operating relative humidity | 10% to 90% |
| Maximum operating altitude | 14.7 to 10.1 psia<br>0 – 15000 ft |

**Table 5. Fluke Networks Wireless LAN Card Specifications**

| | |
|---|---|
| Specification Compliance | IEEE 802.11b, PCMCIA Spec 5.1 |
| Certifications | FCC, CE Mark Commercial |
| Interoperability | WECA Wi-fi for 802.11b |
| Security | 40/64 Bit WEP, 128 RC4 |
| Interface | PC Card Slot |
| Outdoor Operating Range | Up to 1500 ft. |
| Indoor Operating Range | Up to 300 ft. |
| Data Rate | Up to 11 Mbps |
| Infrastructure Mode | BSS |
| Ad Hoc Mode | IBSS |
| Operating Temp | 0° C to 65° C |
| Storage Temp | -20° to 85° C |
| Operating Humidity | 95% |

# Regulatory Notices

## Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio or television technician for help

## Modifications

The FCC requires you be notified that any changes or modifications made to this device that are not expressly approved by Fluke Networks, Inc., may void the Reference authority to operate the equipment.

## *Declaration of Conformity for products marked with the FCC logo - United States only*

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this FCC declaration, contact Fluke Networks, Inc. at:

USA: 1-800-283-5853 (1-800-28-FLUKE)
Canada: 1-800-363-5853 (1-800-36-FLUKE)
Europe: +31-402-675 200
Japan: +81-3-3434-0181
Singapore: +65-6738-5655
Anywhere in the world: +1 425- 446- 4519

## *Canadian Notice*

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

## *Avis Canadien*

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## *European Union Notice*

Products bearing the CE marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11) - Electromagnetic Immunity
- EN61000-3-3 (IE61000-3-3) - Power Line Flicker
- EN 60950 (IEC60950) - Product Safety